NON-PUBLIC?: N
ACCESSION #: 8807120012
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Beaver Valley Power Station Unit 1 PAGE: 1 of 4

DOCKET NUMBER: 05000334

TITLE: Reactor Trip and Feedwater Isolation
EVENT DATE: 06/11/88 LER #: 88-009-00 REPORT DATE: 07/08/88

OPERATING MODE: 1 POWER LEVEL: 013

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Mr. Thomas P. Noonan, Plant Manager TELEPHONE #: 412-643-1258

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SJ COMPONENT: 1SV MANUFACTURER: R165
REPORTABLE TO NPRDS: Y
CAUSE: D SYSTEM: JB COMPONENT: LC MANUFACTURER: W120
REPORTABLE TO NPRDS: N
CAUSE: X SYSTEM: JI COMPONENT: PCV MANUFACTURER: C635
REPORTABLE TO NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On 6/11/88, during a Reactor Startup, the Main Feedwater Regulating Valves (MFRVs) automatic Steam Generator level control was unstable. This caused Steam Generator levels to increase to their Hi-Hi Level setpoint on two occasions, initiating Feedwater Isolation (FWI) signals, as per design. The FWIs shutdown/isolated the Normal Feedwater System and actuated the Auxiliary Feedwater System. After the first event, operators successfully restored Normal Feedwater. After the second event, while attempting to restore Normal Feedwater, the breaker for the 'B' Main Feed Pump's discharge valve tripped while the valve was opening, degrading Feed flow. Operators restored Normal Feedwater flow with the 'A' Main Feed Pump. This action was insufficient to prevent the 'A' Steam Generator level from decreasing to its Lo-Lo Level/Reactor Trip Setpoint. Operators stabilized the plant using the Reactor Trip response procedure. The Steam Generator level instabilities were caused by: 1) using the MFRVs to control level without having the Turbine/extraction steam inservice, 2) improper condenser steam dump response. A Special Operating

Order has been issued to prevent the above configuration. The affected steam dump valves have been isolated. The Main Feed Pump discharge valve functioned properly after its breaker was reset. Its failure is under further investigation. The erratic Steam Generator level control and degraded Normal Feedwater Flow events are bounded by UFSAR analysis.

(End of Abstract)



On June 11, 1988, a Reactor Startup was in progress. At 1615 hours, the Reactor became critical. At 1635 hours, the Station entered Mode 1. The condenser steam dumps (Turbine Bypass Valves) were being used as the Unit's heat sink. Power was increased to 13%. At this point (1650 hours), Steam Generator Feedwater flow control was transferred from the Bypass Feedwater Regulating Valves to the Main Feedwater Regulating Valves. The Bypass Feedwater Regulating Valves were fully closed. Preparations were underway to roll the Main Turbine. The Station intended to bring the Turbine up and sync it onto the grid. Turbine power was then to be increased while steam load was transferred from the condenser steam dumps. This differed from the Station's normal startup method which was to take the Turbine up to approximately 20% power with the Bypass Feedwater Regulating Valves before transferring control to the Main Feedwater Regulating Valves.

However, before the Turbine roll commenced, Steam Generator automatic level control began exhibiting instability. Although operators attempted to manually control level, at 1656 hours, the 'C' Steam Generator level increased to 75% (the Hi-Hi Level Setpoint). This generated a Feedwater Isolation (FWI) Signal. In response to the FWI, the following automatic actions occurred, as per design:

* Normal Feedwater isolated.
* The running normal Feedpump tripped.
* The motor driven auxiliary feedpumps autostarted to supply the Steam Generators with feedflow.

At 1657 hours, the 'C' Steam Generator Hi-Hi Level cleared. Operators reset the FWI signal and restored the Feedwater System to its normal alignment. Turbine roll then commenced. The Turbine was latched. Steam Generator levels were still behaving erratically. At 1712 hours, the 'A' Steam Generator level increased to the Hi-Hi setpoint. A FWI signal again was generated. The following automatic actions occurred, as per design:

* Normal Feedwater isolated.
* The running normal Feedpump tripped.
* The motor driven auxiliary feedpumps autostarted to supply the Steam

Generators with feedflow.
* Additionally, in response to this second FWI, a Turbine Trip occurred. (It had not occurred during the first FWI since the Turbine had not been latched at that time.)



Operators secured Auxiliary feed to the 'A' Steam Generator to assist in restoring level to its normal band. At 1713 hours, the 'A' Steam Generator Hi-Hi Level cleared. Operators reset the FWI signal and attempted to restore normal feed flow. However after starting 'B' Main Feedwater Pump, the operators observed that Feedwater flow was considerably less than its normal value. Operators discovered that the 'B' Main Feedpump's discharge valve had not fully opened after the pump started. The operators secured the 'B' Main Feedwater Pump and started the 'A'. This restored normal feedwater flow. However, at 1718 hours, before the restored feedwater flow could be effective, the 'A' Steam Generator level dropped to its Lo-Lo setpoint (12%). This generated, as per design, a Reactor Trip signal and an Auxiliary Feedwater (Turbine-driven Pump) Initiation signal. Operators stabilized the plant using the Reactor Trip response procedure. Level in the 'A' Steam Generator was restored to its normal operating band.

Subsequent to this event, the Reactor was restarted using the conventional startup procedure. No problems were encountered. It was verified that, under normal operating conditions, the Main Feedwater Regulating Valves responded properly in automatic control. The apparent cause of the Hi-Hi Steam Generator level/FWI events was attempting to control Steam Generator feed flow with the Main Feedwater Regulating Valves during low power operation without having the Turbine online. This configuration resulted in an unstable Steam Generator level control for the following reasons:

* Under low flow conditions, the Main Feedwater Regulating Valves do not have as rapid a response as the Bypass Feedwater Regulating Valves do.
* Without having the Turbine online, no extraction steam was available for feedwater pre-heating. Feeding the Steam Generators with cold water increased level instability.

Additionally, it was discovered that two condenser steam dump valves were not operating properly during this event. The valves would hang up during their strokes, preventing a smooth steam dump response. The resultant steam pressure surges contributed to the Steam Generator level control problems.

A Special Operating Order has been issued addressing these concerns. It requires future startups to be performed using the Bypass Feedwater Regulating Valves until the reactor reaches at least 20% power. Additionally, the

turbine startup is to be performed at lower power levels, in order to make extraction steam available. The affected condenser steam dump valves have been failed closed, pending repairs.

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The Reactor Trip during this event was caused by the failure of the 'B' Main Feedwater Pump's discharge valve to fully open. Because Normal Feedwater could not be restored in a timely manner, Auxiliary Feedwater had to be used for an extended period of time. This large insertion of cold Auxiliary Feedwater into the Steam Generators caused the Reactor Coolant System to experience a rapid cooldown to 510 degrees Fahrenheit. This cooldown, combined with the degraded Normal Feedwater flow, caused Steam Generator levels to decrease, resulting in the Lo-Lo Steam Generator level.

The 'B' Main Feedwater Pump discharge valve's motor was tested for any electrical failure. No problems were found. After the valve's breaker was reset (the breaker had tripped on motor electrical protection), the valve functioned properly. Investigation into the cause of this failure is continuing.

There were no safety implications due to this event. Erratic Steam Generator level control, resulting in Hi-Hi Steam Generator level and a Feedwater Isolation, is analyzed in Beaver Valley Unit 1 UFSAR Section 14.1.9, "Excessive Heat Removal Due to Feedwater System Malfunctions". Degraded feedwater flow due to a Main Feedwater Pump discharge isolation valves not fully opening is bounded by the safety analysis of UFSAR Section 14.1.8, "Loss of Normal Feedwater".

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July 8, 1988
ND3SP
:0250

Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
LER 88-009-00

United States Nuclear Regulatory Commission

Document Control Desk
Washington, DC 20555

Gentlemen:

In accordance with Appendix A, Beaver Valley Technical Specifications, the following Licensee Event Report is submitted:

LER 88-009-00, 10 CFR 50.73.a.2.iv.," Reactor Trip and Feedwater Isolation.

Very truly yours,

/s/ T. P. NOONAN
T. P. Noonan
Plant Manager

cj

Attachment

ATTACHMENT # 1 TO ANO # 8807120012 PAGE: 2 of 2

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ND3SPM:0250
Page Two

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